

Distributed Leak Detection System Using Structure-Borne Noise, Phase II

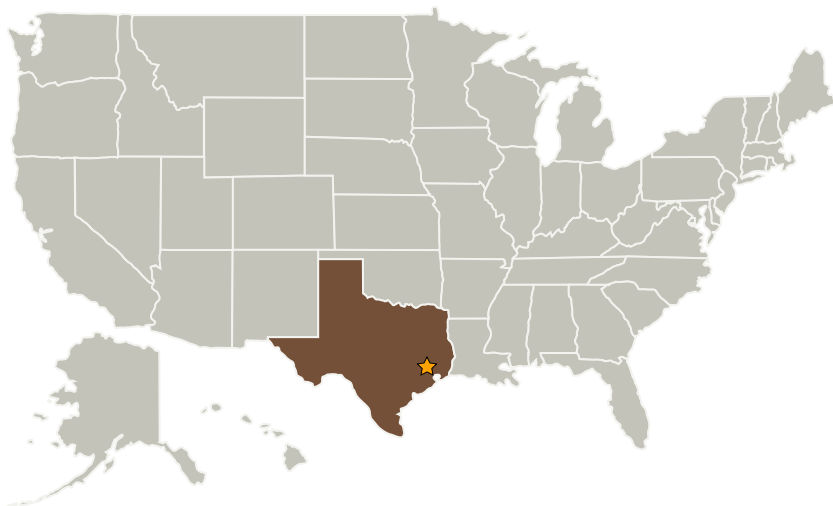
Completed Technology Project (2008 - 2010)



Project Introduction

Manned spacecraft are vulnerable to air leaks caused by micrometeoroid and space debris impact. The ability to detect and quickly locate and mitigate a pressure vessel breach is critical to the safety of any long duration spacecraft, such as the International Space Station or a proposed lunar base or mission to Mars. Current NASA protocol for finding a spacecraft leak uses a handheld ultrasonic directional microphone, similar to those widely deployed industrially, to detect the 40 kHz airborne ultrasonic hiss generated by the downstream leak turbulence. However, known limitations exist regarding the use of airborne ultrasonic emissions for locating leaks in the spacecraft environment because the downstream side of the leak occurs into the vacuum of space, creating reduced leak noise inside the pressure vessel. Blockages of the transmission of airborne ultrasonic energy by structural components, avionics, and equipment racks also limit the detection range of such systems. An alternative approach that we propose is to monitor the spacecraft structure itself---the pressure vessel skin---for leak-generated surface-borne ultrasound by means of a flexible and modular electronics package with fully integrated surface sensor arrays, data acquisition electronics, and radio frequency communication capabilities.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Invocon, Inc.	Supporting Organization	Industry Veteran-Owned Small Business (VOSB)	Conroe, Texas

Primary U.S. Work Locations

Texas

Project Transitions

▶ **August 2008:** Project Start

✓ **August 2010:** Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.3 Aero Propulsion
 - └ TX01.3.1 Integrated Systems and Ancillary Technologies